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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/601,657	06/24/2003	James A. DiCarlo	61011.00005	1278

7590 03/02/2007  
Squire, Sanders & Dempsey LLP  
14th Floor  
8000 Towers Crescent Drive  
Tysons Corner, VA 22182

EXAMINER
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CROUSE, BRETT ALAN

ART UNIT	PAPER NUMBER
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1774

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/02/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

**Office Action Summary**

Application No.

10/601,657

Applicant(s)

DICARLO ET AL.

Examiner

Brett A. Crouse

Art Unit

1774

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 13 December 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 4, 5, and 7 are rejected under 35 U.S.C. 102(b) as being anticipated by (Warren, US 4,397,901) hereinafter known as Warren.

As to claims 1, 4, and 7:

Column 3, lines 24-28, teach a composite article, which is dimensionally stable at high temperatures.

Column 3, lines 44-51, teach that the fibers of the substrate of the composite articles are free to move relative to the applied coating.

Column 5, lines 13-24, teach the basic structure of the composite article comprising a substrate of carbon fibrous and / or ceramic materials, a metallic carbide, oxide, or nitride compliant layer, and a carbide, oxide, or nitride layer over the entire periphery of the substrate.

Column 7, line 13 through column 9, line 8, examples 1 and 2, teach carbonized fibrous substrates with silicon comprising coatings and silicon carbide outer layer. The deposition temperatures of the silicon carbide layers, is above 1600 degrees Celsius. The passage further teaches that the articles are dimensionally stable at high temperature. The passage further teaches that the outer silicon carbide layer is uniform and provides an

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impermeable skin over the entire article. This is held as equivalent to the dense layer of silicon carbide as required by claim 7.

As to claim 5:

Column 6, lines 41-47, teach silicon carbide as the compliant layer.

Warren does not recite the need to induce fiber debonding via heat treatments after matrix consolidation. The debonding as recited in claim 1 of the instant invention is in a product by process format and it is held that Warren teaches an equivalent product.

Claims 1, 2, 4, and 5 are rejected under 35 U.S.C. 102(b) as being anticipated by (Ray, US 5,098,871) hereinafter known as Ray as evidenced by (Nicalon, in About: Composites / Plastics, <http://composite.about.com/library/glossary/n/bldef-n3600.htm>) and (Silicon Carbide Continuous Fiber, Nippon Carbon Co., LTD, <http://www.carbon.co.jp/english/products/develop/develop.html> ).

Ray teaches:

Column 3, lines 18-21, teach a ceramic matrix composite comprising a web or mat of fibers of silicon carbide.

Column 6, lines 8-26, teach that the fibers and one or more coatings will be unbonded or weakly bonded to the matrix. The passage further teaches that the matrix can move or slide on the fibers without breaking the fibers. The passage further teaches that coatings upon the fiber can be viewed as lubricants between the fiber and matrix.

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Column 7, lines 18-66, examples 1 and 2, and column 6, lines 51-68: Example 2 and the method of example 1 teaches Nicalon (SiC) fiber having a boron nitride coating. The passage further teaches sintering the matrix. Sintering the matrix causes densification of the matrix, see column 6, lines 51-68.

Ray does not teach the need to induce fiber debonding after matrix consolidation. The debonding as recited in claim 1 of the instant invention is in a product by process format and it is held that Ray teaches an equivalent product. Ray is also silent as to the dimensional stability of Nicalon (SiC) fiber. The suitability of Nicalon fibers at temperatures up to 1700 degrees Celsius is evidenced by the manufacturers website.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1,4 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rocher et al (US 5476685) in view of Fehrenbacher et al(US 6506483 B1). The primary reference to Rocher et al (US 5476685) teaches the claimed non-oxide ceramic fibers with specific coating thereon- col 1, lines 19-42, col 1 , lines 59-63., col 2, line 12-13, col 6, lines 56-58. Although the cited primary reference substantially teaches the claimed invention , it is however silent about its fibers being stable. The secondary reference to Fehrenbacher et al, however, teaches that it is known in the art to include dimensionally stable fibers in similar ceramic composite material as primary reference- claim 1, col 3, lines 1-29, col 6, lines 51-65. It would have been obvious to one of ordinary skill in the art at the time the invention is made to combine the teachings of the cited secondary reference and utilize such types fibers, in the absence of unexpected results motivated by the desire to improve oxidation resistance to the composite - col 2, lines 60-63. The reference teaches silicon carbide in col 3, lines 3-27, see primary reference. Concerning claim 4, the reference teaches constituent stability in col 2, lines 60-67., e,01 2, lines 19-22. the reference teaches silicon carbide in col 3, lines 25-26.

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Claims 2,3,6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rocher et al (US 5476685) in view of Singh et al (US 5945166) and Fehrenbacher et al ('483 B1). The cited primary reference teaches the basic claimed invention including a ceramic matrix composite comprising non-oxide ceramic fibers with a coating thereon, as discussed above, inter alia. Although the primary reference heat treats its product col 2, lines 7-22, the reference fails to expressly teach such treatment to manipulate stress in the matrix and further shrink its product. The primary reference fails to teach specific types fiber material. The reference to Singh et al, however teaches these aspects in col 2, lines 5-7., col 6, claim 6. Further, Fehrenbacher et al teaches employing specific types fiber material (see above). It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Singh et al and Fehrenbacher et al and both utilize specific type fiber material and further facilitate stress manipulation in such composite in Rocher et al, in the absence of unexpected results motivated by the desire to produce composite with desired properties- 1 2, lines 8-19, col 3, lines 24-29. Also, see Fehrenbacher et al (above). Concerning claims 6 and 7, the primary reference teaches dimensional unstable coating- col 2, lines 60-65., col 2, lines 55-59. The primary reference teaches silicon carbide coatings in col 3, lines 5-14.

Claims 8,9 and 11-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Rocher et al (US 5476685) in view of Fehrenbacher et al ('483 B1). The primary reference teaches the claimed process including selecting specific material, forming non-oxide fibers, coating the fibers and heating the resulting material to form a composite- col 1, lines 59-66., col 2, lines 7-

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33. Fehrenbacher et al('483 B1) more clearly teaches specific types fiber material used during similar process like that of the primary reference. The reference teaches that it is known in the art to include dimensionally stable fibers in similar ceramic composite material as primary reference- claim 1., col 3, lines 1-29., col 6, lines 51-65. It would have been obvious to one of ordinary skill in the art at the time the invention is made to combine the teachings of the cited secondary reference and utilize such types fibers, in the absence of unexpected results motivated by the desire to improve oxidation resistance to the composite - col 2, lines 60-63. Concerning claim 9, the reference teaches debonding of the constituents in col 2, lines 51-64. The reference teaches similar coating material possessing identical properties as claimed by virtue of the coating material is identical- see above. Concerning claims 13, 14 and 15, it is submitted the types articles and its characteristics/properties used during the claimed process are of no patentable consequences to the instant question for patentability which must be manipulatively distinct.

With regard to the amended language of claim 8, paragraph [0027] of the present application teaches "BN interphase deposition typically occurs at a temperature lower than the temperature typically employed for CVI Sic matrix formation ( $\sim 1000^{\circ}\text{C}$ ), which in turn is lower than the maximum production temperatures for some near stoichiometric Sic fiber types ( $>1600^{\circ}\text{C}$ ).” Singh teaches deposition of the intermediate layer at a temperature less than 1000 degrees Celsius and infiltration temperatures greater than 1000 degrees Celsius, typically 1350-1450 degrees Celsius, see column 4, lines 6-11 and column 4, lines 32-40.

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Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Rocher et al(US 5476685) in view of Singh et al(US 5945166) and Fehrenbacher et al ('483 B1). The reference teaches the claimed process as discussed above, inter alla. The primary reference, however, fails to expressly teach specific types material used during its process and further fails to teach such treatment as claimed to manipulate stress in the matrix and further shrink its product. The reference to Singh et al, however teaches these aspects in col 2, lines 5-7, col 6, claim 6. It would have been obvious to one of ordinary skill in the art at the time the invention is made to combine the teachings of the cited references to Singh et al and Fehrenbacher et al ('483 B1) and facilitate such composite shrinking in Rocher et al, and further utilize specific types material, as taught by Fehrenbacher et al ('483 B1), in the absence of unexpected results motivated by the desire to produce composite with desired properties- col 2, lines 8-19, col 3, lines 24-294 Singh et al ('166).

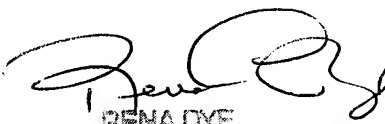
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brett A. Crouse whose telephone number is 571-272-6494. The examiner can normally be reached on Monday - Friday 6:00AM - 2:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Rena Dye can be reached on 571-272-3186. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

BAC



RENA DYE  
SUPERVISORY PATENT EXAMINER  
AU1774

<b>Notice of References Cited</b>	Application/Control No. 10/601,657		Applicant(s)/Patent Under Reexamination DICARLO ET AL.	
	Examiner Brett A. Crouse		Art Unit 1774	Page 1 of 1

**U.S. PATENT DOCUMENTS**

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	Classification
*	A	US-4,397,901	08-1983	Warren, James W.	428/101
*	B	US-5,098,871	03-1992	Ray, Siba P.	501/95.2
	C	US-			
	D	US-			
	E	US-			
	F	US-			
	G	US-			
	H	US-			
	I	US-			
	J	US-			
	K	US-			
	L	US-			
	M	US-			

**FOREIGN PATENT DOCUMENTS**

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

**NON-PATENT DOCUMENTS**

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	(Nicalon, About: Composites / Plastics, <a href="http://composite.about.com/library/glossary/n/bldef-n3600.htm">http://composite.about.com/library/glossary/n/bldef-n3600.htm</a> )
	V	(Silicon Carbide Continuous Fiber, Nippon Carbon Co., LTD, <a href="http://www.carbon.co.jp/english/products/develop/develop.html">http://www.carbon.co.jp/english/products/develop/develop.html</a> )
	W	
	X	

\*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)  
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## Nicalon

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**Definition:** A SiC fiber manufactured by Nippon Carbon Company. When incorporated into a borosilicate or high silica glass matrix, Nicalon provides high flexural strength, high crack-growth resistance, and toughness.

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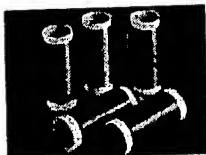
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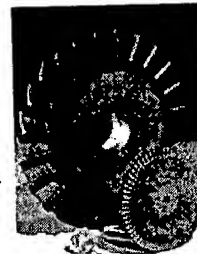
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## Fruits of R&amp;D

**Silicon Carbide Continuous Fiber (NICALON/Hi-NICALON)**

NICALON Silicon carbide continuous fiber shows high strength, high elasticity and heat resistance up to 1300°C in an inert gas atmosphere. It is used as reinforcement for polymer and ceramic matrix composites. Hi-NICALON has heat resistance up to 1700°C in an inert gas atmosphere. It is expected to be used in the hot parts of gas turbines for power generation and the hot parts for space and aircraft.

**NICABEADS**

Nicabeads(ICB, PC, MC-grade) are produced from resin by carbonizing and treating the surface under thermocontrol.

MPX-grade is an artificial graphite powder.

The products are dispersible, electrically conductive and resistant to chemical erosion. Due to these superior properties, the products can be used as electrically conductive fillers and for sliding applications.

**<Properties>**

There are 3 grades with different surface treatment.

ICB are vitreous carbon micro-beads. PC is ICB coated with pitch. MC is ICB coated with carbon black.

MPX is made from pitch.

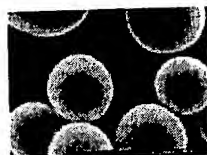
Average particle diameters:

ICB :5, 10, 20, 150, 200, 700μm

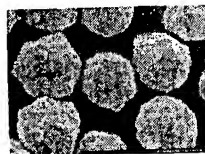
PC :5, 10, 20μm

MC :5, 10, 20μm

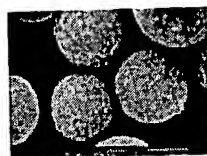
MPX :3, 6μm(1μm is under development)



ICB-grade



PC-grade



MC-grade

**Characteristics**

Nicabeads have unique characteristics in addition to those of carbon.

ICB, PC, MC-grade

MPX-grade

(1)Spherical.

(1)Homogeneity.

(2)Uniform in grain size.

(2)Uniform in grain size.

(3)Hard.

(3)Super fine particles.

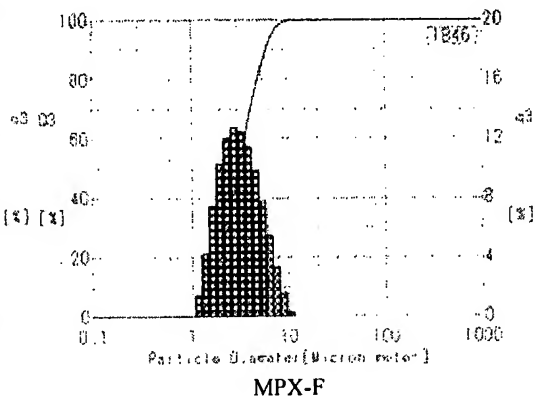
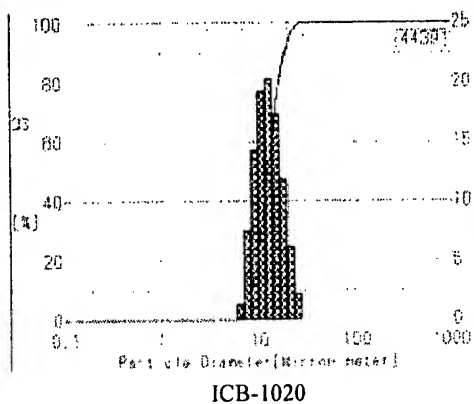
(4)Good dispersion.

(4)Good sliding properties.

Grain Particle Diameter Distribution(Sample)



MPX-grade


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 ☐ Chemical products
 ☐ Fine carbon products
 ☐ Battery materials

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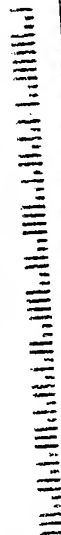
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